FERC Hydropower Notices for the Traditional Licensing Process

The FERC Licensing Process -
Issues, Opportunities and Responsibilities

Michigan Department of Natural Resources

I. Introduction

The objective of this position paper is to discuss hydroelectric dams and their impacts on aquatic resources, and the role of the Michigan Department of Natural Resources (MDNR) in the licensing of hydroelectric projects under the authority of the Federal Energy Regulatory Commission (FERC).

FERC has regulatory control over all hydroelectric facilities and their operation that impact interstate trade, have had post-1935 construction, use surplus water or waterpower from a federal dam, occupy federal lands, or are located on navigable rivers. The DNR has some jurisdiction over and considerable management responsibility on rivers that have hydroelectric facilities located on them. Hydroelectric facilities limit our resource management options on watersheds by adversely impacting both the riverine environment and the aquatic ecosystem in which they operate. Our role, as a state resource agency, is to: 1) recommend data needs to evaluate these facilities; 2) recommend the needed mitigation for impacts; and 3) recommend license conditions for each project. FERC is the ultimate decision-maker in this process as discussed later in this document.

This is a critical time because many hydroelectric facilities will be licensed in a regulatory climate where environmental concerns are treated equally to power production. Decisions made now will affect many of our most important fisheries for the next 30 to 50 years.

There are 103 hydroelectric facilities operating in the State of Michigan. They impact 49 river systems, including almost every major river system in Michigan. These facilities prevent, at minimum, anadromous fish movement into 2063 mainstem river miles, dewater 57 river miles, directly impound 623 river miles and impact through their operation 733 river miles. The total reservoir area impacted by these facilities is approximately 123,000 acres. These facilities produce, in net, 1.5% of the electricity in the State of Michigan (Patric and Kakela 1983).

To date, FERC has issued 66 licenses for projects in Michigan covering 75 power dams (three of which are also storage reservoirs) and 6 storage reservoirs. There are 52 fully licensed projects and 14 exempted projects. Over the next 5 years, 16 hydroelectric facilities and 2 storage reservoirs will be re-licensed on 14 licenses (21% of the total number of complete licenses), and 20 hydroelectric facilities and two storage reservoirs will be licensed for the first time.

II. The FERC Licensing Process

Introduction. The above discussion indicates that hydroelectric facilities have a wide range of important impacts on our state's resources. Almost all of our facilities were constructed before 1953 in a social climate where environmental impacts were not considered. Thus, the environmental costs have not been paid for hydroelectrically produced power. These costs by industry analysis may be higher than power from coal, gas turbine or nuclear powered sources. We now, through the FERC licensing and re-licensing process, have the opportunity to re-examine these facilities and change, if necessary, their operation and land use to meet natural resources needs over the next 30-50 years.

The FERC has regulatory control of the hydroelectric industry under the Federal Power Act. The licensing process is conducted in consultation with other resource agencies such as the U.S. Fish and Wildlife Service, the U.S. Forest Service and the U.S. Environmental Protection Agency. MDNR, as a state resource agency, has an important role to play in an environmentally sound fashion. Our role as an

agency is to recommend license conditions, based on a combination of existing data and data collected and summarized from our recommended studies, designed to ensure that these facilities will not damage the resources of the State of Michigan. The present regulatory climate, where power and non-power interests are considered equally, has greatly enhanced our role. We do not have the ability to dictate operational terms. Only FERC has the regulatory authority over all aspects of licensing including the impact study needs and the determination of actual operating conditions.

The FERC licensing process is a three stage consultation process which will take 5 years for re-licensing projects and 1.5 years for licensing projects. This is a mandatory consultation process involving both the resource agencies and the general public. The process for most re-licensing projects started in December 1988, and was scheduled to be completed in December 1993. Although starting and completion dates for new licensing projects vary because of FERC extensions of the licensing process, most of the remaining FERC licenses which will regulate the operation of 36 hydroelectric plants and 4 storage reservoirs should be issued by 1996.

The following outlines the FERC licensing process and shows where the MDNR fits in.

Stage 1. The initial consultation stage, which begins with the distribution of the initial consultation package (ICP) (which contains a summary of the project's engineering data, environmental data and proposed mitigation), and ends 30 days after formal public meetings and comments from the consulted resource agencies and the general public. During this stage, resource agency concerns are identified, and project study and data needs are determined.

Stage 2. This stage, which consists of data gathering and license application preparation, commences after stage one and consists of the determination of study designs, data gathering, and review of the draft application and study data by the resource agencies. The application is then submitted to FERC. FERC has the option of: 1) accepting the application; 2) accepting it with some deficiencies to be corrected; or 3) to reject it. Once FERC accepts an application, stage 3 is then started. All of stages 1 and 2 were completed by Dec. 1991 for most re-licensing projects.

This is usually the time period when the Department is requested to provide the Project a Section 401(a) Water Quality Certification under the Clean Water Act. The Department has one year to act on such a request or it is considered to be waived. These Certifications are designed to ensure that the project meets state water quality standards and prevents any impairment of designated uses.

Stage 3. This stage consists of the evaluation by FERC of the application and the determination of license articles that will govern the operation of the facility for between 30 to 50 years. Stage three commences with the acceptance of the license application and ends with the issuance of the license. Once the application is accepted, it is public noticed for sixty days.

This sixty day period is the critical time for resource agency and public input, and for interventions to be filed. During the public notice period agencies and the public make their final recommendations for license conditions if the license is noticed as available for environmental review. All interventions, which make the intervenor a formal party to all additional actions, must be filed with FERC in this time period.

After the comment period, FERC takes the following actions: 1) writes the necessary environmental assessment or environmental impact statement; 2) examines whether the project is in concert with all filed comprehensive plans; 3) examines cumulative impacts of all hydroelectric plants on river basins; 4) determines the necessary mitigation measures; and 5) writes and issues the license. The Department has the opportunity to comment on the draft environmental assessment or environmental impact statement. Any disagreements on the FERC staff recommended fish and wildlife measures in the draft document are attempted to be rectified during a Section 10(j) hearing. After this hearing, the

final license is issued and all appeals or rehearing requests are due within 30 days of the license issuance date.

In summary, the FERC licensing process provides a historic opportunity to safeguard, through our recommendations and input, the aquatic environment of 24 river systems for the foreseeable future. The process will shape the aquatic resources and recreational opportunities of these critical systems for 30-50 years.

III. Department FERC Mission

The Michigan Department of Natural Resources' mission in the FERC licensing or re-licensing process is to protect and enhance the natural resources by minimizing adverse impacts on natural resources and society resulting from hydropower operation.

Department Goals

The Michigan Department of Natural Resources' goals in the FERC licensing or re-licensing process are to: 1) prevent significant deterioration of our natural resources, in particular aquatic resources, resulting from hydropower operations; 2) identify and abate or minimize or seek mitigation for adverse impacts of hydropower operations; 3) identify the responsibilities of the licensee for the long term maintenance and/or removal of the structure when the licensee determines it is no longer cost effective to continue; and 4) obtain guarantees for the safe operation and maintenance of the structure for the life of the project.

Department Objectives

The Michigan Department of Natural Resources has the following objectives in regards to hydroelectric facilities:

1) Protection of River and Reservoir Aquatic Resources. To minimize and mitigate the negative impacts of hydroelectric facilities by operating these projects in a fashion that offers aquatic resources and users near natural riverine and reservoir conditions, protects and maintains aquatic environments and fish communities and rehabilitates those now degraded. This should be accomplished using the following operational constraints:

   A) Projects with riverine tailwaters are to be operated in a run-of-the-river mode.

   B) Projects with lacustrine tailwaters are to be operated with minimal tailwater and headwater fluctuation.

   C) By-passed and/or diverted river reaches are to be operated in a manner which maintains healthy aquatic resources of the bypassed and/or river reaches.

2) Fish Passage. To minimize and mitigate for the negative impacts of hydroelectric facilities on fish movements using adequately designed fish passage for moving both potadromous and resident fish around hydroelectric facilities as determined necessary by the Michigan Department of Natural Resources for the appropriate management of the river system, and to ensure that options for future aquatic management are protected in river systems where fish passage is not presently deemed necessary.

3) Fish Entrainment and Mortality. To minimize and mitigate for the loss of fish at every hydroelectric facility from either turbine or spillway passage to protect and maintain fish communities, and rehabilitate those now degraded.

4) Water Quality. To minimize and mitigate for the impact of hydroelectric development on water quality to protect and maintain aquatic environments and fish communities, and rehabilitate those now degraded.

5) Recreation. To optimize the use of hydroelectric facilities for recreation, and to secure assured public access and appropriate facilities on all waters impacted by hydroelectric facilities which support or have the potential to support significant public fisheries.

6) Terrestrial Management. To minimize and mitigate the impact of hydroelectric development on wildlife species, and to optimize the terrestrial management of all project lands for the appropriate management of wildlife.

7) Threatened/Endangered/Sensitive Species. To protect and enhance all threatened/endangered/sensitive species in areas impacted by hydroelectric development.

8) Long Term Project Responsibility. To ensure that FERC holds the licensee responsible for the long term maintenance and ultimate disposition of the structures, and to guarantee MDNR input on all dam safety issues.

Specific Hydroelectric Impact Areas

Hydroelectric dams impact river systems in seven major areas: project operation, fish passage, fish entrainment and subsequent mortality, water quality, recreation, and terrestrial management. The following is a issue specific analysis of the area along with the Departments specific positions on each issue:

1) Project Operation. Michigan hydroelectric projects operate in one of three operating modes: run-of-the-river, semi-peaking or peaking. Peaking operations generate power for parts of the day and store water, with little or no release of water, the rest of the day. Generally, peaking operations generate power during 8 am to 5 pm on weekdays when the price of power is the highest. Semi-peaking operations run one unit continuously and turn on other units to take advantage of peak power rates. In a run-of-the-river operation (by our definition) instantaneous inflow equals instantaneous outflow, which mimics the flow of the river without any dams. Many hydroelectric projects divert water from the river channel for power generation, and two projects (Bond Falls on the Ontonagon River and Lower Paint on the Paint River) divert water between river basins.

Hydropower operations impact our water resources by: 1) altering normal stream flows for generating purposes; 2) dewatering river channels by diversion or peaking operations; and 3) fluctuating reservoir levels for either peaking operations or for storage purposes.

The impacts of peaking operation include the flushing of riverine reaches by generating with flood flows during the peak power periods and dewatering of riverine reaches at other periods. The dewatering of riverine habitat reduces the algal and aquatic plant life which are important as food for aquatic insects and which provide important fish nursery areas. Further, it reduces fish growth and survival by reducing available habitat and stranding fish, and changes the benthic invertebrate community to smaller, less useful, fish foods. The fluctuations cause downstream erosion and sedimentation which destroys fish habitat and can disrupt fish migratory patterns. In addition, peaking operations result in reservoir fluctuations which dewater and disrupt fisheries habitat in the same fashion as the tailwater habitats.

Studies by Bain and Finn (1988), Cushman (1985), Nelson (1986) and Gislason (1985) all documented significant negative impacts, that included reductions in river productivity and recruitment

failure in stream fishes, that peaking operations cause by de-stabilizing daily flow patterns on riverine systems. Instream Flow Incremental Methodology (IFIM) studies on projects in Michigan support these studies. These studies have documented habitat losses up to 99% for non-mobile life stages and species (i.e. spawning, incubating eggs, fry and benthos) and between 40-70% for mobile life stages and species (i.e. juvenile and adult fish) for projects proposing full peaking operation.

Other studies have documented a significant change in behavior and population characteristics in the spawning run of lake sturgeon when a project was converted to run-of-river. The following changes were documented: 1) increase in the average size of the lake sturgeon; 2) an increase in spawning readiness; 3) a decrease in the amount of time the spawning fish remained in the river thus decreasing their exposure to adverse conditions and poaching; and 4) an increase in the overall size of the spawning run (Auer 1987, Auer 1988, Auer 1989, Auer 1990, and Nancy Auer, Michigan Technological University, personal communication). It appears that lake sturgeon are adversely effected by daily flow instability like that created by peaking hydroelectric projects, thus run-of-river is critical to the rehabilitation and restoration of lake sturgeon populations.

Semi-peaking plants, although a little more stable in both pond and tailwater levels, cause many of the same problems caused by peaking operations.

Run-of-the-river projects operations by mimicking a natural un-impounded river have the least direct environmental impact and do not show the same adverse impacts as found at peaking or semi-peaking operations. However, because reservoirs do alter water quality, aquatic life below dams is different from un-impounded reaches.

Projects that divert water around river reaches or from one river basin to another dewater the bypassed river reaches and change the natural flow pattern of the bypassed river reach. These perturbations cause: 1) a direct loss of aquatic habitat by drying up large sections of rivers; 2) disruptive changes in fish behavior which waste energy, alter migratory patterns and curtail reproductive activities; 3) benthic organism community composition changes similar to those discussed for peaking operations; 4) loss of key high gradient habitat areas; and 5) decreased overall productivity of the system.

Our position on project operation described above is: 1) all projects that have riverine tailwaters should be operated as run-of-the-river projects; and 2) All projects that have lakes as tailwaters should be operated with the least amount of tailwater and impoundment fluctuation.

On projects that pursue some other operational scheme, we will recommend both instream flow and reservoir impact studies to determine the impact of the proposed operation on the aquatic system, and compare it with our recommended operational mode to allow for specific recommendations on a case by case basis.

Our position on both bypassed river channel and cross-basin diversions is to ask that adequate flows are provided from the project to protect the aquatic resources of the impacted reaches. We will request that all projects with these impacts conduct instream flow studies to collect the data needed to make a determination of the necessary flows to protect these resources.

2) <u>Fish Passage.</u> Fish movement is disrupted by dams. We need to determine when and where specific fish species are to be allowed past a dam. Each river system will be evaluated on a case by case basis to determine where additional passage is warranted.

On fish passage, we will recommend: a) providing for natural reproduction and establishment of self perpetuating fish stocks; b) allowing for the free passage of isolated fish stocks that will provide for increased genetic diversity and survival of the species; and c) maintaining high value or high profile

fisheries. Anywhere upstream fish passage is recommended, downstream protection may also be recommended.

At all facilities where fish passage is not immediately recommended, MDNR will either: a) recommend that a license provision be included that allows for the installation of fish passage when management of these systems requires it; or 2) request FERC order issuing license language that specifically states that the general license reopener can be used for fish passage and what information is needed to use this license article for fish passage.

3) Fish Entrainment and Mortality. Fish are directly impacted by turbines, and in some cases spillways. Studies on anadromous fish from the Pacific and Atlantic coasts show mortalities of between 5-90% at each facility (Eicher et al. 1987). Since 1985, there have been 35 fish entrainment and mortality studies conducted in the State of Michigan with 3 studies currently ongoing. These studies have provided the following entrainment and mortality estimates:

a) Mean project entrainment - 519 ± 879 fish/day (range 60-4566 fish)
b) Mean project mortality - 21% ± 10% (range 3-48%)
c) Number of fish lost per project per year - 38,705 ± 71,725 (range 1,363-351,887)
d) Biomass lost per project - 8,452 ± 16,824 lbs/year (range 192-70,838)
e) Annual value of fish lost per project
    i) restitution value - $409,949 ± 786,071 ($13,125-3,414,132)
    ii) replacement value - $47,506 ± 79,410 ($1,191-331,295)

Items a-d are based upon data from 22 of the studies and e is based upon 18 of the studies. These studies were selected because the complete dataset was available.

In addition, the Department has attempted to develop a model of entrainment and mortality to allow for the prediction of these rates. Thus far, no relationships have been found between project characteristics and entrainment. There has been no correlation between discharge, acreage, retention time, depth or existence of upstream facilities. In summary, there is no way to predict entrainment even where projects are adjacent and head to tail (i.e. the lower AuSable River and Tower and Kleber Projects). These projects demonstrated significant differences in species composition and numbers entrained.

Staff from the Wisconsin DNR have also examined within project trends in entrainment (Thomas Thuemler, WI DNR, Personal Communication). They found that there are significant unit to unit variation in numbers and species entrained. Thus, sampling just one unit is inappropriate and all units at a project must be sampled.

The Department has also attempted to look at mortality by project. No trends have been found between mortality and unit type or project configuration

Given the above information, the Department will recommend protective devices or studies at all facilities. Study data will be used to determine value of the fisheries impacted by the project and the appropriate mitigation. Given the site to site variation in entrainment and mortality, data will need to be collected at all sites to determine the necessary mitigation. This information is needed to protect both warmwater and coldwater fish both of which are designated uses of our waterways under Michigan law.

4) Water Quality. Hydroelectric facilities also impact aquatic resources by changing the water quality characteristics of the river system. The major problem areas are: 1) low dissolved oxygen from dam releases which usually occurs in stratified reservoirs with deep hydro intakes; 2) temperature changes

from the ponds acting as heat sinks; 3) changes in groundwater inputs to the river system which also change the temperature of the system; 4) mobilization of contaminants which can occur in stratified lakes; and 5) changes in nutrients and the type and amount of entrained plankton. All of these factors can greatly impact and constrain our management of our systems.

Water quality studies at licensing and re-licensing projects found problems with low dissolved oxygen and temperature changes. Data from the Hardy Project documented dissolved oxygen concentrations as low as 1.5 mg/l. This project, which is 125 feet deep, strongly stratifies and has a deep intake. The combination of these factors has lead to low dissolved oxygen concentrations in the tailwater. Data from other projects on the Manistee and AuSable Rivers have demonstrated violations of the state water quality standard for dissolved oxygen. Significant deviations from temperature standards, particularly for the delta T standard, have been documented for numerous projects including the Prickett Project (Sturgeon River, Baraga County), Dead River Projects, the Boney Falls Project (Escanaba River), the Mio Dam Project, the Alcona Dam Project and the Tippy Dam Project. Rapid temperature changes (up to 10 C changes in 10 minutes) have been documented at the Bond Falls Project and the Alcona Dam Project. Clearly, hydroelectric projects can and do cause significant water quality impacts in Michigan waters.

The Department recommends that the project mitigate for all known water quality problems documented at the facility. We recommend a water quality study be conducted to survey the water quality at all facilities and pinpoint problem areas. Data from this study and any other available data will be used to determine needed mitigation so MDNR can issue a Section 401(a) Water Quality Certification under Clean Water Act, which guarantees that water quality standards will be met by the facility. These Certificates will also contain requirements for continued water quality monitoring to ensure compliance with state standards.

5) Recreation. Hydroelectric facilities impact recreation in important ways. Access is unavailable or discouraged at some hydroelectric projects. Other projects have inadequate boat launches, poor tailwater access and often use state owned facilities for meeting FERC responsibilities. It is FERC's and our intent that recreational use be accommodated at hydroelectric facilities in an optimal manner.

Our position is to optimize the recreation use at hydroelectric facilities as stated in Commission Policy Number 3401 (Dated July 13, 1979). We will recommend that adequate boat launching facilities be available on impoundments, safe canoe portages be provided, accessible impoundment shoreline fishing access be provided, and that adequate tailwater access be provided. All facilities will be made accessible to the physically challenged to ensure compliance with the Americans with Disabilities Act (ADA) in accordance with the provisions of that act. Additional recreational needs will be determined after our recommended recreational survey is completed at each site. All facilities and improvements will be made by the project as part of their operating license.

The Department will also recommend that the project be responsible for developing, operating, and maintaining all project related recreational facilities including those leased to the Department by the licensee as stated in Commission Policy Number 3401.

6) Terrestrial Management. Upland and wetland resource management for optimal use of the project lands will be evaluated at each site. Many projects have considerable upland resources which may not have been optimally managed. In addition, significant opportunities for increasing waterfowl production, enhancing and protecting T/E/S species, and increasing biodiversity through sound land management practices exist on project lands.

Our position is to optimally manage these upland and wetland resources. We will recommend that each project examine its policies, and conduct a wildlife study of the associated upland and wetland wildlife community to determine what mitigation and/or enhancement can be made to their lands to

optimize their use. Buffer zones should be developed around all project impoundments and river reaches to prevent resource degradation. In addition, the Department will seek to maintain all existing lands within the present project boundaries and to establish appropriate project boundaries at new FERC licensed projects to ensure that all development is compatible with natural resource goals.

7) Project Retirement. All hydroelectric facilities will face retirement with perpetual care or removal being necessary after the economic life is complete. Once these facilities exceed their economic life or are sold or transferred to entities that cannot maintain them they pose serious threats to fisheries habitat. Most hydro operators lack the necessary finances and do not understand the importance of operating and maintaining these facilities in the state in which they are licensed. As a result, they quickly fall into serious disrepair and become a liability to their owners. Because of the high cost of repairing and maintaining structures that have exceeded their economic life or are in disrepair they are ignored by their owners. The State of Michigan has seen several of these dams fail and wash out in the past several years, due to high rainfall events. These failures have caused extreme erosion, excessive sediment deposition and destruction of aquatic habitat accompanied by the loss of the fisheries. The MDNR has been saddled with the responsibility of removal of several retired hydroelectric projects at taxpayer expense after the owners sold the facilities, upon the end of their economic life, to entities unable to maintain them. In addition, the 1991 GAO report on the Elwha River Projects indicates that upon retirement a significant amount of money will need to be made available to retire these projects. The Department will recommend that a funding mechanism to ensure either removal or perpetual care is included in all FERC licenses to avoid having the taxpayers through the MDNR bear the decommissioning expenses of hydropower development and to protect the aquatic habitat in the project vicinity. It is important that the present and future rate payer's who enjoy the use of the power from the operating project should bear the cost of retirement of the project, when necessary. Only when FERC considers the cost of retirement during the license application can FERC truly balance economics and environmental stewardship, and only then, can FERC determine whether a project provides net public benefit.

Therefore, it is the Department’s position that a trust account be setup for each regulated utility and a cash bond be posted for all independent power producers to prepare for that eventual and certain point in the life of a hydropower projects, when they will be retired and either perpetually maintained or removed. The Department is willing to examine other alternative retirement funding mechanisms that are equivalent to the trust fund or cash bond in function.

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